

HLT-plans and discussion

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Advantages of HLT for FWD

- Allows sophisticated (offline) analysis
- Process ~100% of events
- Real time, saved with run report similar to online plots
- Robust environment
- In principle can write data back to DAQ (e.g. reco cluster)

Tracking in HLT

- Opportunity for (offline) analysis
 - Track finding
 - CA track finding is ROOT independent + fast < 10 ms / event (can be faster too)
 - Value of having this in HLT
 - True RefMult plot -> good indication of efficiency
 - Indication of global alignment -> stretch goal: In principle alignment could be done online / continuously?
 - Track fitting
 - GenFit is too slow / too many dependencies for HLT
 - StiCA has track fitting internal – not clear if we can reuse that easily
 - If we need to write a track fitter, consider simple Kalman filter:
 - with homogenous magnetic
 - Extremely simple material description
 - Advantages: required for vertex reconstruction, high level physics analysis
 - HLT multi-pass approach -> TPC PV may not be available
- Higher level physics analysis : dN/dp_T , RefMult, event selection (Drell-Yan?)

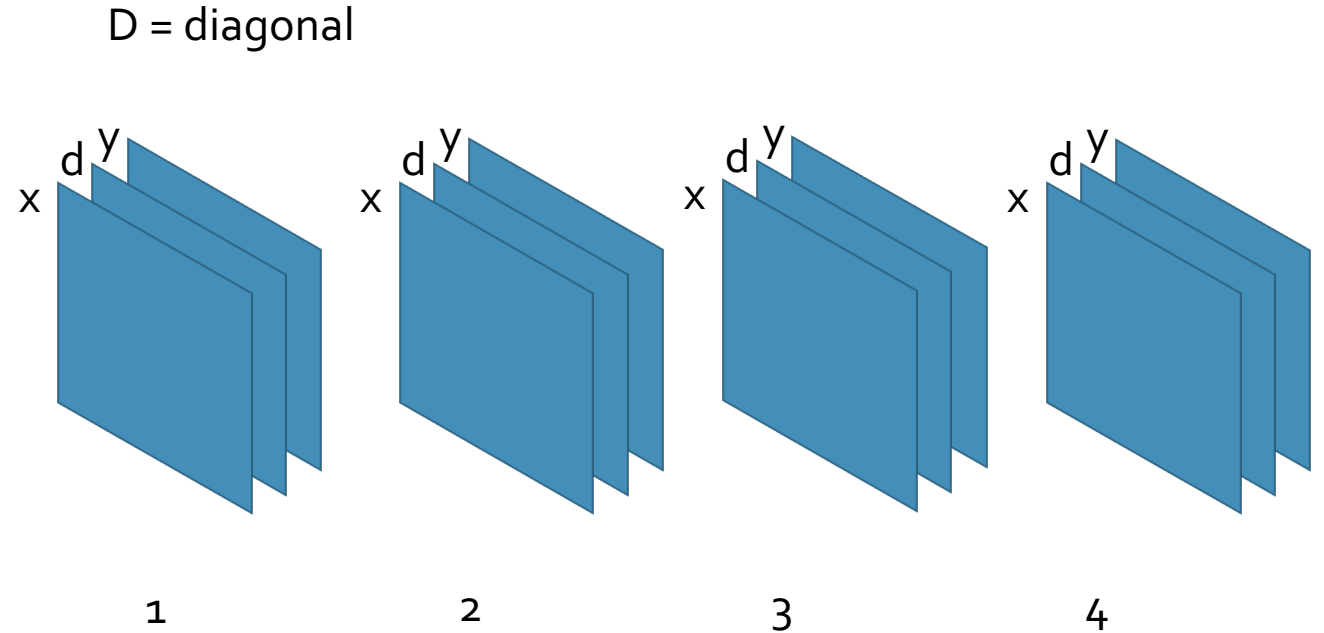
Efficiency algorithm on HLT

As discussed earlier, efficiency calculation is essentially pseudo track finding procedure

If cluster finding is done in DAQ online PC -> implement efficiency in HLT



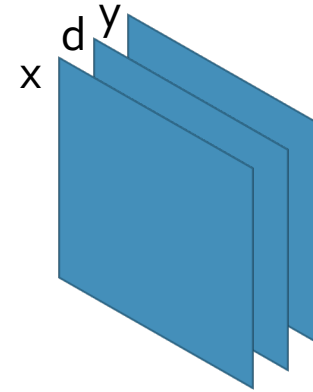
collision point



- If we have track finding then the refmult vs. time may a good proxy to efficiency
- We can also look at ratios of #s of hits on tracks (how many have 4/4, how many have only 3/4, etc.)

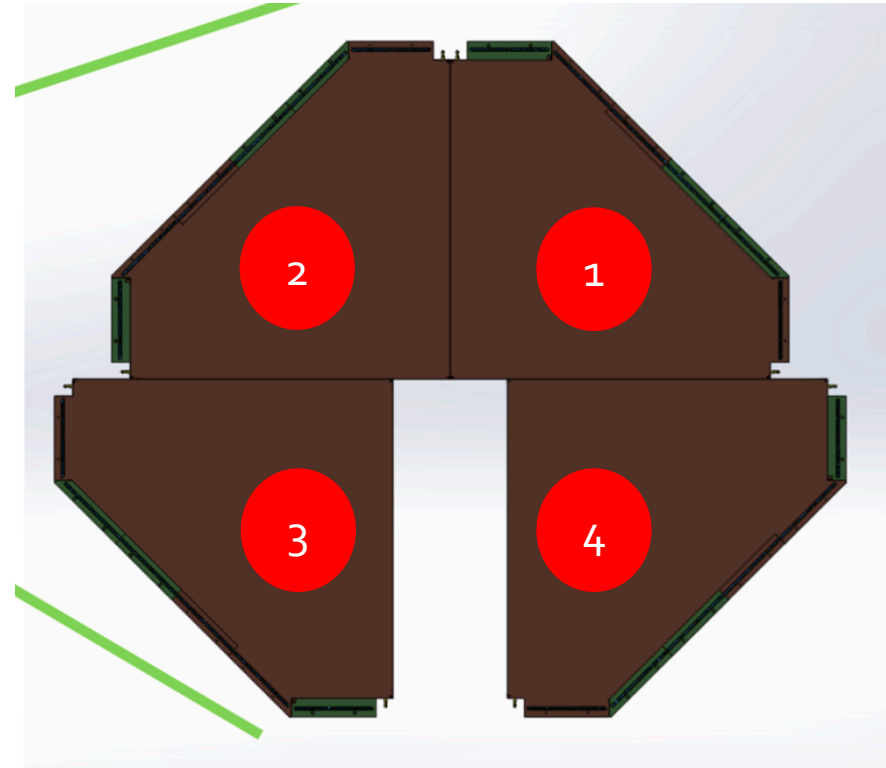
Preliminary Alignment Plan

- Precision alignment of forward systems
 - Combination of internal(local) + global alignments



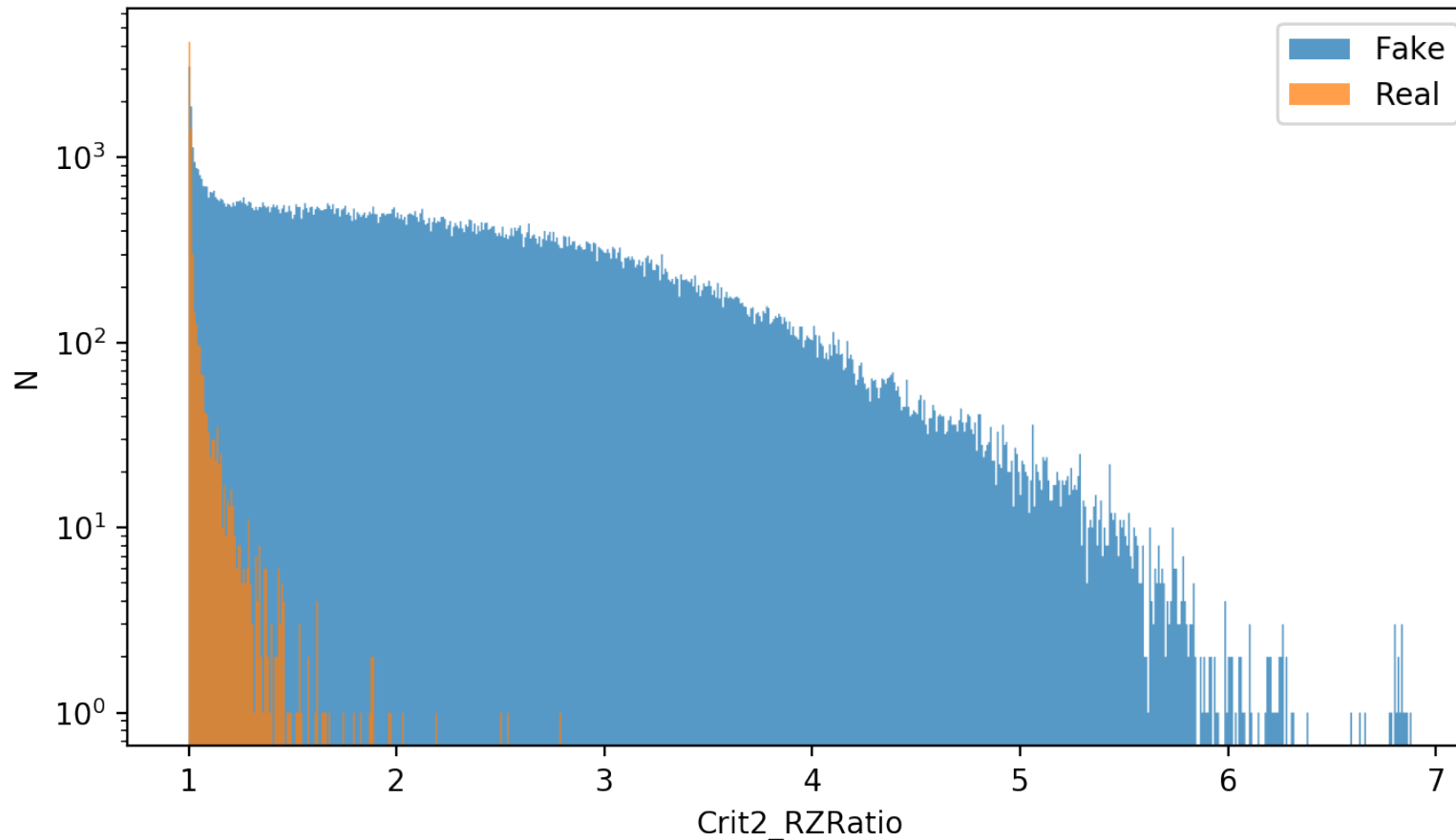
sTGC Example:

- Internal alignment
 - X / d / Y correspondence
 - Module to module :
 - Translation: $dx, dy, (dz?)$
 - Rotation : α_z
- Global Alignment
 - Translation: dx, dy, dz
 - Rotation : α_x, α_y



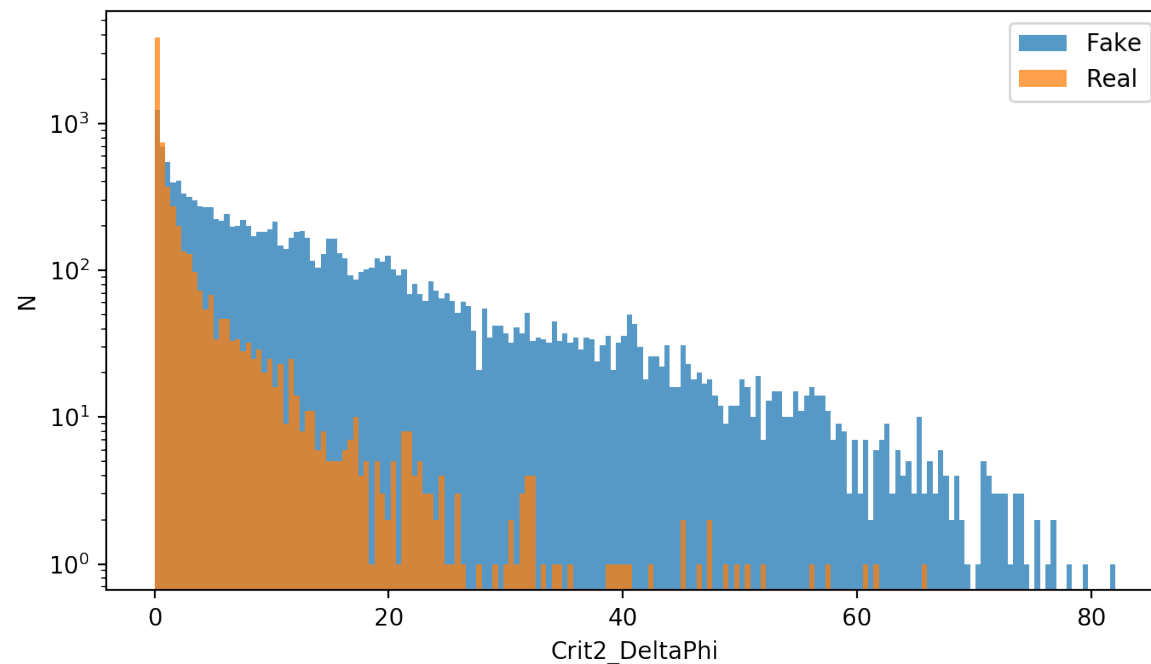
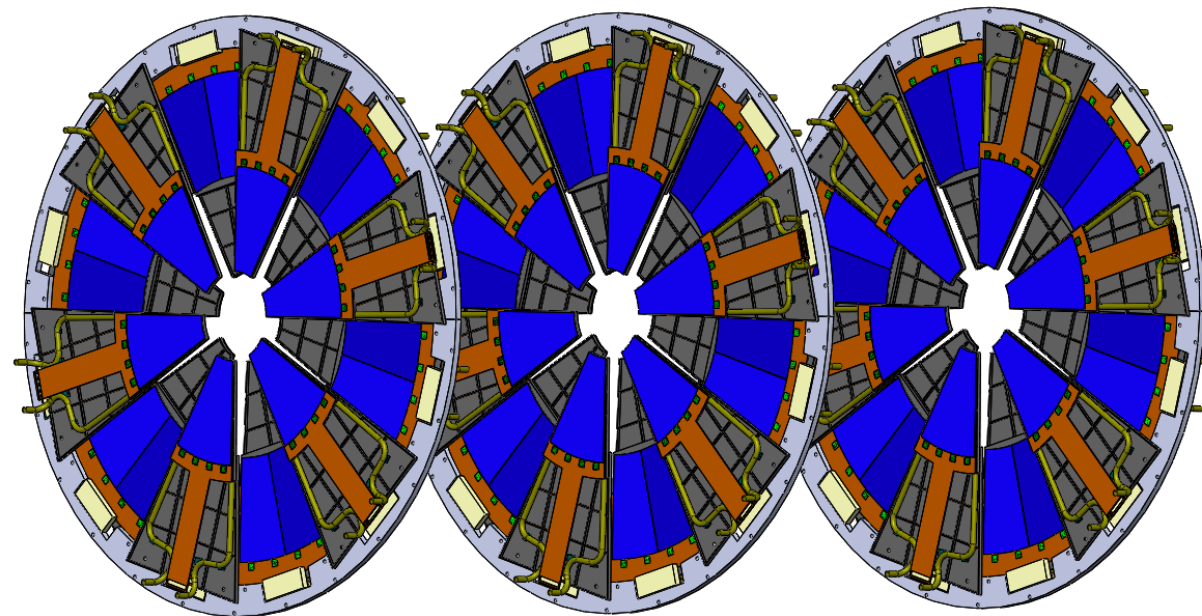
Global Tracking Alignment

- sTGC global alignment can be determined **iteratively**
- Optimize on straight-line correspondence of hits (in $r - z$)
- sTGC to FST alignment will be challenging



FST Alignment

- Internal alignment
 - Inner to outer sector
 - Translation: $dr\ d\phi$
 - Rotation: α_z (local)
- Disk to disk & sTGC
 - Translations: dx, dy, dz
 - Rotations: $\alpha_z, \alpha_y, \alpha_x$
- FST has precision $d\phi$ – optimize track seed Delta phi
- For both internal and global alignment



Alignment to FCS

- Use same technique as TPC track -> TOF matching
- Allow the FCS geometry to float (global translation)
- Project tracks to high quality clusters
 - Calculate dx, dy, dz from track projection vs. measured FCS position
- Iterative approach
- Unless shown otherwise, assume no distortion (global rotations)

Summary

- IMHO, having basic tracking and analysis in HLT is 100% worth it
- Main issue is manpower / organization
 - Different environment means special care is needed to write code that will run on HLT
 - Help from / reuse of StiCA track fitting would be a huge help
- Track finding with CA should be relatively easy to implement in HLT
- Main issues with tracking
 - Alignment in HLT: If alignment is done in HLT, good. If not need to import offline alignments
 - Needs to be fast ~10s ms / event max
 - Cannot use GenFit
 - Multi phases – current setup, cannot use TPC primary vertex for FWD fitting